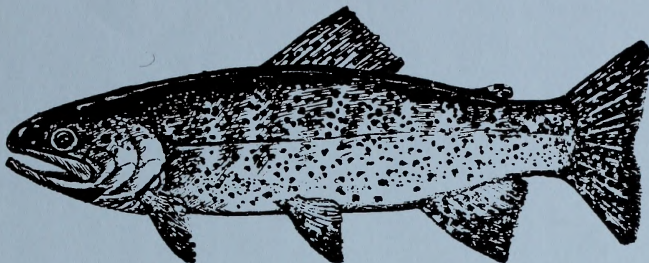


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AQUATIC INVENTORIES OF THREE MOUNTAIN LAKES IN NORTHERN IDAHO



by

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**Aquatic Inventories of Three Mountain Lakes
in Northern Idaho.**

Robert F. Raleigh

Bureau of Land Management, Idaho State Office
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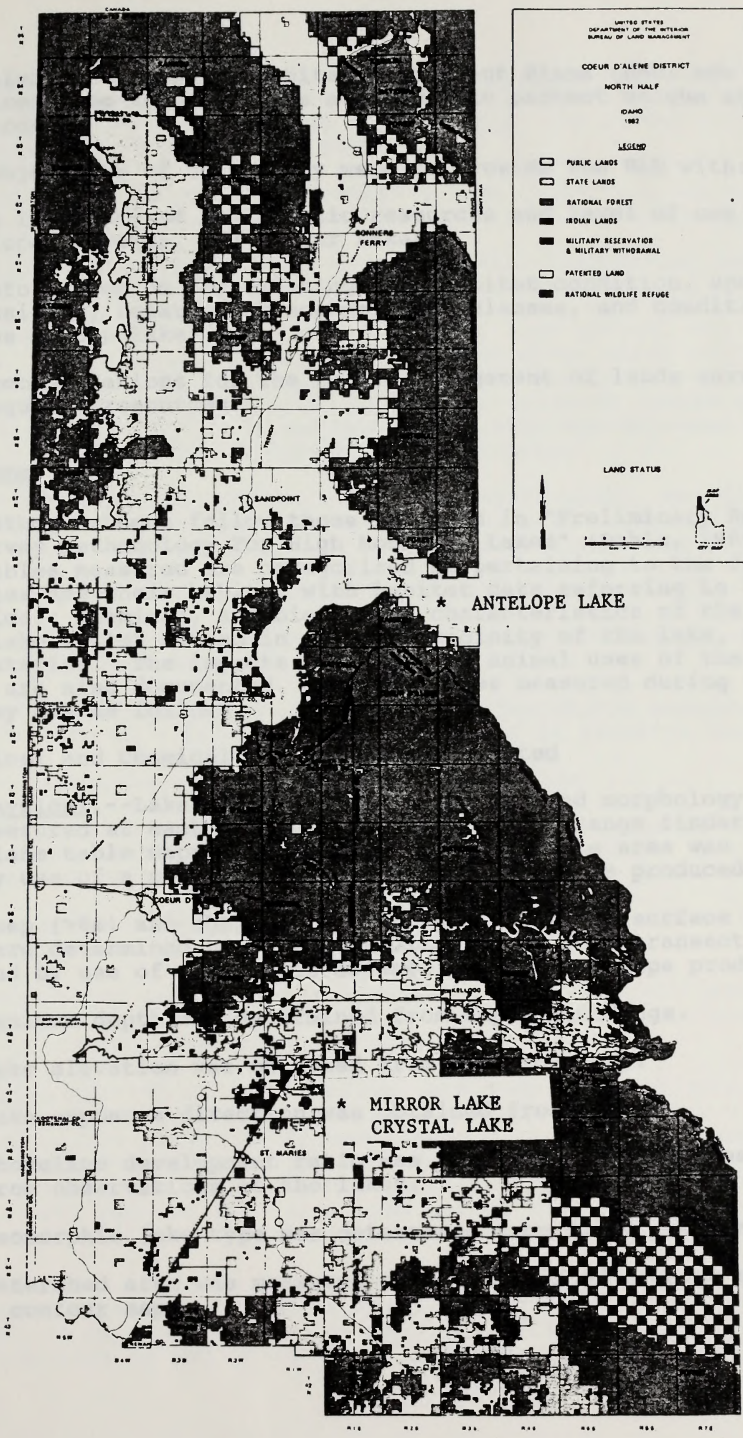
Abstract.—Aquatic inventories were conducted on three small, high mountain, cirque lakes located on lands managed by the Bureau of Land Management, Coeur d' Alene District Office. Antelope Lake is located in the Clark Fork Quadrangle near Clark Fork, Idaho. Mirror Lake is located in the Twin Crags Quadrangle south of Antelope Lake. Crystal Lake is located in the Rochat Peak Quadrangle about four miles south of Mirror Lake. Antelope Lake contains hatchery rainbow trout, Crystal Lake contains westslope cutthroat trout, and Mirror Lake appeared to be devoid of fishes. All three lakes are slightly acidic, have low conductivity and alkalinities, and limited aquatic invertebrate diversity. The inlet and outlet streams of all three lakes are too small to support spawning populations of fishes.

Key Words: limnology, mountain lakes, rainbow, cutthroat, trout, northern Idaho.

Raleigh, R.F. 1993. Aquatic inventories of three mountain lakes in northern Idaho. Bureau of Land Management, Technical Bulletin 93-3, Boise, Idaho.

INTRODUCTION

A variety of laws, Executive Orders, and policy statements require the Bureau of Land Management (BLM) to manage fisheries and associated aquatic resources on a sustained yield basis within a multiple-use framework, without loss of habitat capability, and with special attention to aquatic resources with unique values. A basic knowledge of the character and extent of the aquatic resources is required in order to meet the requirements of this mandate. Basic information needed to guide management policy direction is obtained by inventorying each aquatic resource and incorporating the data base into Resource Management Plans (RMP). These RMPs are used to prescribe general management practices and land use decisions that may affect the management and well-being of the aquatic resources. More










UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

COEUR D'ALENE DISTRICT
NORTH HALF

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1982

LEGEND

-  PUBLIC LANDS
-  STATE LANDS
-  NATIONAL FOREST
-  INDIAN LANDS
-  MILITARY RESERVATIONS
& MILITARY WITHDRAWAL
-  PATENTED LAND
-  NATIONAL WILDLIFE REFUGE

LAND STATUS



* ANTELOPE LAKE

* MIRROR LAKE
CRYSTAL LAKE

detailed site specific Habitat Management Plans (HMP) are prepared from the data base as needed to protect unique aquatic resources.

The objectives of this study were to provide the BLM with:

1. An inventory of the aquatic resources and level of use of Antelope, Crystal, and Mirror Lakes;
2. Information on the existing fish habitat condition, species composition, relative abundance, size classes, and condition of fishes in the lake; and
3. Recommendations for the future management of lands surrounding the aquatic resources.

METHODS

The study methods follow those outlined in "Preliminary Report Of A Survey Methodology For High Mountain Lakes" (Bahls, 1989). The variables measured are categorized as pertaining to the fish species and their habitat with habitat data referring to the physical, chemical, and biological characteristics of the lake, the lake outlet stream in the near vicinity of the lake, and lake tributaries. The impacts of human and animal uses of the lake area are also documented. The variables measured during the survey are as follows.

Physical and Chemical Habitat Data Collected

Physical.--Lake surface area (hectares) and morphology was measured at each lake using a split image range finder and plane table mapping procedures. The surface area was checked by use of a modified acreage grid on the maps produced.

Deep (>6m) and shallow (<6m) areas (% of lake surface area) were determined by depth soundings along lake transect lines and by use of a modified acreage grid on the maps produced.

Maximum depth was determined from depth soundings.

Lake elevation was obtained from a contour map.

Lake exposure direction was obtained from a map.

Shoreline development ratio was obtained from the maps and from observations at the lakes.

Geomorphic lake type was determined from field observation.

Watershed area was measured using a modified acreage grid and a contour map.

Percent substrate composition from shore to the three meter depth contour interval was determined by observations at the lake, by use of a modified acreage grid, and a lake contour map developed from depth soundings.

Littoral zone substrate sediment type (color and texture) was determined by field observations and hand texture sampling.

Potential spawning areas (in lake, lake tributaries and outlet) was estimated by walking the lake shore and making ocular estimates of the square meters of potential spawning substrate within the lake, along the lake outlet, and along all tributaries with a sufficient estimated water depth to permit spawning during spring flows. Substrate from coarse sand to gravel ≤ 7.5 cm in size was considered usable spawning substrate. A 7.5 cm maximum gravel size was selected because all fishes observed were < 37 cm in length.

Average bankfull width, wetted perimeter width, and depth of streams were measured across the high water mark and across the wetted perimeter along each potential spawning tributary.

Average stream gradient was estimated in percentage.

Dominant stream substrate was from ocular estimates as the streams were surveyed by walking.

Fish access length was estimated by pacing the distance from the lake to a fish barrier, or absence of spawning habitat.

Barrier type was classified by observation.

Minor inlet streams, springs, and seeps were marked on a rough drawing of the lake as the shoreline was walked. All water sources were marked on a scale drawing of the lake.

Air and surface water temperatures were taken with a hand held thermometer with the time of day noted.

Deep water temperature was measured from water collected by sampling bottle near the lake bottom. The temperatures were read immediately after reaching the surface.

Chemical.--Shoreline, shallow, and deep water pH were measured with an Oakton water test kit with a rated accuracy of ± 0.1 from water collected by sampling bottle: 1. from near the shoreline at a depth of about 0.5 m; 2. from about 1.5 m deep; and 3. from water collected near the bottom of the deepest part of the lake. The Oakton test equipment was calibrated for pH just prior to sampling the lake.

Shoreline, shallow, and deep water conductivities were measured with an Oakton water test kit with a rated accuracy of ± 1 mV from samples of water collected at the same locations as the pH tests. The Oakton water test kit was

recalibrated for conductivity just prior to sampling the lake.

Shallow and deep water alkalinities were titrated with 0.5N H₂SO₄. Both phenolphthalein and methyl orange alkalinities were measured.

Biological Data Collected

Flora.--Aquatic vascular macrophytes were from ocular estimates of the relative abundance (rare, common, or abundant) of each type during the shoreline survey.

Sedges were determined as above.

Terrestrial lake shore vegetation was from ocular estimates of the percent coverage of vegetative types within a 10 m wide strip around the lake as the lake shore was walked.

Fauna.--Deep and shallow water zooplankton were determined from four plankton hauls: two 5-7 m horizontal hauls from shore about 10 m apart and two vertical hauls from the deepest part of the lake. A #10 net with a 30 cm diameter opening was used for zooplankton collections. The two samples for each area, shore or deep water, were combined and preserved in collection bottles. Counts and identifications were made from aliquot samples using a microscope and counting cell. Since the plankton net did not have a meter, zooplankton relative abundance was estimated from the aliquot sample counts.

Aquatic invertebrates were collected using a very fine mesh (linen cloth) sweep net while surveying the shoreline. Every habitat type encountered along the shoreline was sampled several times. Rubble-boulder substrate was removed and examined from stream habitats. In addition, fish stomachs from gill net mortalities were examined. Aquatic invertebrates were identified to order, life stage, and relative abundance noted.

Vertebrate animals observed, identified tracks, and other evidences of presence in the vicinity of the lake were noted in a field book.

Fish data.--Fish species composition of the lakes were determined from angling, gill net captures, and observations in shallow water areas while surveying the lake shore, tributary, and outlet streams. An experimental gill net with six 25 ft panels of the following inch bar mesh sizes (3/8, 1/2, 3/4, 1, 1 1/2, 2) was used as needed.

The relative abundance of the fish by species (very low, low, moderate, high, and very high) was estimated from catch-per-unit-of-effort figures from angling and gill net captures and from observations of the frequency of fish rises on the lake.

Fish size range and condition (very poor, poor, fair, good, or excellent) was determined for all fish captured. Each fish was weighed to the nearest gram and the fork length in centimeters measured. The condition factor was calculated from individual lengths and weights.

Natural reproduction potential was estimated based on data collected on fish size classes sampled and observed and the estimated amount and condition of spawning substrate present.

Habitat Use Data

Numbers of people and activities observed were recorded during the time we were at the lake.

Numbers of campsites and impacts were estimated from counts of campsites and fire rings in the vicinity of the lake, the amount of litter, and the condition of the trail and lake shore.

Animal damage was determined by observed animal-use damage to trails, stream banks, and lake shore areas.

Access difficulty was determined by the trail condition, distance to lake, and the steepness of the trail.

Angling pressure was determined by the number of people in the area, observed activities, and talking to people while at the lake. It was also indirectly assessed by the numbers and condition of campsites around the lake.

Photo Documentation

Photographs (35mm slides) were taken of the lake, fish sampled, and any notable conditions. The slides were taken with a 35mm Minolta camera with a 50mm lens.

Notes

Notes of the above aspects of the survey were recorded in a waterproof notebook.

ANTELOPE LAKE

RESULTS

Physical Habitat Data.

Location and Morphology. Antelope Lake is a small (7.7 hectare), cirque lake located east of Clark Fork, Bonner County, Idaho in Township (T) 55N., Range (R) 2E., Section (S) 12 in the Idaho Panhandle National Forests area. The lake is located at an elevation of 2770 feet. About two thirds of the lake is on private land. Only the eastern one third of Antelope Lake is located on lands managed by the BLM. The lake is surrounded by steep mountains on three sides with a western exposure. About 12.1 hectares of watershed drains directly into Antelope Lake. The lake is fed by small springs and seeps. The lake outlet stream is very small with an estimated outflow of about 0.1 cfs at the time of the inventory. Antelope Lake has a maximum depth of 10.2 meters with about 60% of the lake <6 m deep. Depth contour lines at three meter intervals, lake shape, and lake shore development are displayed in figure 1. The lake substrate from shore to the three meter depth contour is comprised of 35% rooted aquatic plants, 50% dark, fine textured mud and silt, 5% submerged logs, and 10% boulders and gravel.

Chemical. The lake waters contained 4.0 mg/l CO₃ and 6.0 mg/l HCO₃ alkalinities, had a conductivity of 139 umho/cm², and a pH of 9.1 near shore, and 7.6 near the bottom. The water temperature was 23.0 C. at the surface and 16.5C. near the bottom at 1320 hours. The secchi disc was visible to the bottom of the lake (10.2 m).

Access and use. The lake can be reached via two miles of narrow dirt road in poor condition. The access road, parking, and camping areas appear to be on private land. The trail around the lake is well used and trampled in the parking area, developed and used along two thirds of the south shore, poorly developed and lightly used along the northwest side, and lightly used and difficult to follow around the rest of the lake. There are five campsites and five fire pits along the west and southern two thirds of the lake (Figure 1). Litter was moderate near the parking area. One fire area on a rock ledge about two thirds of the way down the south lake shore was a 50 gallon drum stove. The drum was filled with cans and trash.

The road to Antelope Lake is located about three miles south of Clark Fork, Idaho. There were 20 visitors to the lake during the two day study period. Local resident visitors reported that the lake was fairly popular and visited frequently by fishermen, campers, and recreationists. This is confirmed by the trampled condition of the parking and camping sites near the end of the road.

Antelope Lake.

Plants submerged, rooted aquatic plants were collected throughout the lake bottom. Species were abundant along the shore, each side of the lake and along the water margin. Aquatic vegetation was visible in 17 areas around the lake including an estimated 30% water, 15% grasses and sedges, 10% algae, and 40% rocks.

Fish (continued): The following observations were collected and reported while walking around the lake shore. Aquatic invertebrates were amphipods (water shipworms, mollusks (snails), insects (two species of dragon flies), Coleoptera (water boatman) and various two species, waterbugs, and millipedes). Terrestrial invertebrates observed were Lumbricidae (two species of earthworms), Diptera (two species of Tabanidae, one species of Muscidae), Arachnida (scorpions), Hemiptera (four species, ticks, mites, and lice).

Antelope Lake appears to be a fairly high quality lake for recreational effort.

The lake was a natural trout stream. The lake was stocked with rainbow trout in 1962. Antelope Lake has been stocked with hatchery rainbow trout since 1962. The lake was stocked with trout through 1971. The 1971 stocking records were not available, but water relations that were observed or reported during the survey.

There were 29 persons that visited the lake during the time that we were at the lake. The length of the visit was 1.1-1.3 and averaged 1.2. The catch per unit of effort was 2.5 fishes per hour.

0 = fire ring
+ = camp site

Antelope Lake appears to receive a fairly high number of recreational visits. There were 29 people and seven cars that visited the lake during a 7 1/2 hour period in the middle of the

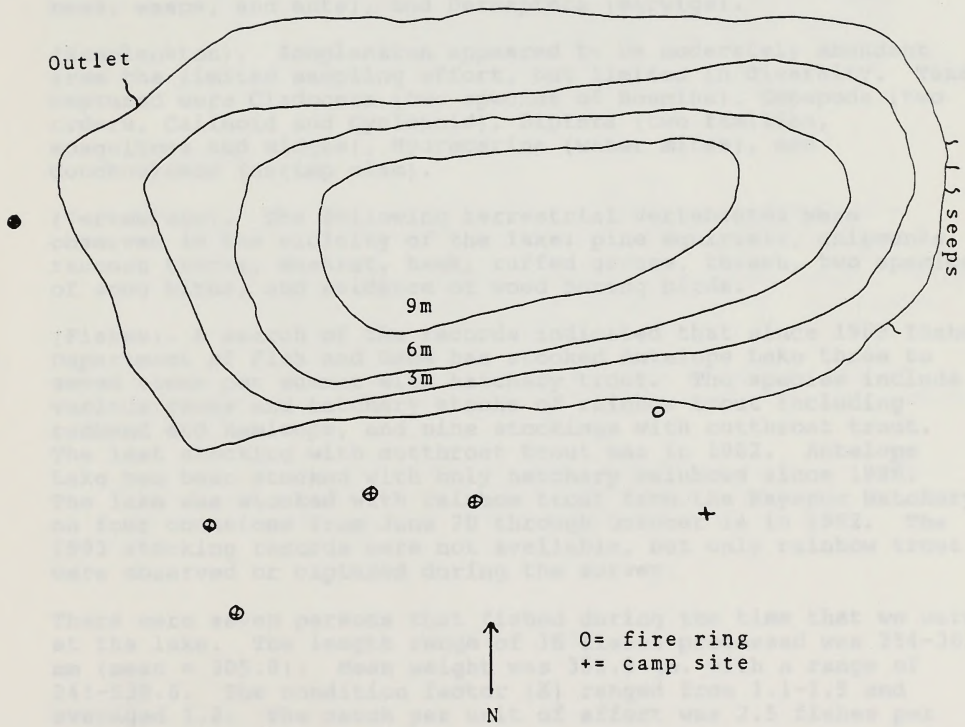


Figure 1. Antelope Lake with three meter depth contours.

Biological Data.

Flora. Submerged, rooted aquatic plants were abundant throughout the lake bottom. Rushes were abundant along the north west side of the lake and along the north shore. Shoreline vegetation within a 10 meter band around the lake included an estimated 30% rushes, 15% grasses and sedges, 20% shrubs, and 35% trees.

Fauna (Invertebrate). The following invertebrates were collected and observed while walking around the lake shore. Aquatic invertebrates were Hemiptera (water skippers), Mollusca (snails), Odonata (two species of dragon flies), Coleoptera (water boatman), and Diptera (two species, mosquitoes, and midges). Terrestrial invertebrates observed were Lepidoptera (two species of butterflies), Diptera (two species of Tabanidae, one species of Muscidae), Arachnida (spiders), Hymenoptera (four species, bees, wasps, and ants), and Dermaptera (earwigs).

(Zooplankton). Zooplankton appeared to be moderately abundant from the limited sampling effort, but limited in diversity. Taxa captured were Cladocera (two species of Bosmina), Copepoda (two orders, Calinoid and Cyclopoid), Diptera (two families, mosquitoes and midges), Hydracarina (water mites), and Conchostraca (shrimp clam).

(Vertebrate). The following terrestrial vertebrates were observed in the vicinity of the lake: pine squirrels, chipmunks, raccoon tracks, muskrat, hawk, ruffed grouse, thrush, two species of song birds, and evidence of wood boring birds.

(Fishes). A search of the records indicated that since 1969 Idaho Department of Fish and Game has stocked Antelope Lake three to seven times per summer with hatchery trout. The species include various races and hatchery stocks of rainbow trout including redband and kamloops, and nine stockings with cutthroat trout. The last stocking with cutthroat trout was in 1982. Antelope Lake has been stocked with only hatchery rainbows since 1988. The lake was stocked with rainbow trout from the Hayspur Hatchery on four occasions from June 20 through October 14 in 1992. The 1993 stocking records were not available, but only rainbow trout were observed or captured during the survey.

There were seven persons that fished during the time that we were at the lake. The length range of 16 fishes processed was 254-362 mm (mean = 305.8). Mean weight was 355.9 gm. with a range of 241-538.6. The condition factor (K) ranged from 1.1-1.5 and averaged 1.2. The catch per unit of effort was 2.5 fishes per hour.

DISCUSSION

Antelope Lake appears to receive a fairly high number of recreational visits. There were 20 people and seven cars that visited the lake during a 38 hour period in the middle of the

week in mid-August. The parking area and nearby camping areas showed heavy use.

The lake has a surface area of about 7.7 hectares, an average depth of about 4.5 m., and a maximum depth of 10.2 m. The lake has a population of rainbow trout in good condition ($K = 1.2$). The trout are of hatchery origin. This is evident from the hatchery stocking records, the lack of suitable spawning habitat, and the nipped fins on all rainbow trout captured. The lack of spawning habitat will make the lake entirely dependent upon periodic hatchery stocking.

The water supply to the lake is from a series of springs and seeps primarily around the south and east sides of the lake. The surface water temperature was warm. Water temperatures varied from 23 C. at the surface to 16.5 C. at the bottom at mid-day on August 12. Fish food production in the lake and trout growth appear to be high. The density of submerged, rooted aquatic plants may cause occasional periods of low dissolved oxygen concentrations during winters with a deep snow pack, but the lake depth would mitigate any possible low oxygen problem.

RECOMMENDATIONS

1. Manage the lake for recreation. Livestock grazing would cause conflicts with the well established recreational use.
2. Continue to stock the lake with hatchery rainbow trout. They appear able to survive the warm water conditions of late summer and the possible occasional low oxygen conditions of winter.
3. The road into the lake may be on private property, but it needs improvement work. The risk of vehicle accidents and damage appears high.
4. Recreational use and visitor rates appear to be high. There is a need to have an outdoor toilet installed; preferably in the vicinity of the parking area even though it is on private property.

CRYSTAL LAKE

RESULTS

Physical Habitat Data.

Location and Morphology. Crystal Lake is a small (4.7 hectare), cirque lake located in Benewah County, Idaho in the Rochat Peak Quadrangle, T 47N., R 1E., S 31. The Lake is located at an elevation of 5290 feet on lands managed by the BLM in the Idaho Panhandle National Forests area. The Lake is surrounded with

steep mountain slopes on three sides with a northern exposure. About 56% of the lake is >6 m deep with a measured maximum depth of 11.7 m. A secchi disk is visible to the bottom. Depth contour lines at 3, 6, and 9 m depths and shoreline development is shown in figure 2. The lake shore substrate to the 3 m depth contour was comprised of about 70% silt with about 15% cobble and boulders and 10% sunken logs scattered around the lake shore.

The lake is fed by nine small springs and seeps along the south and south west sides (Figure 2). The largest spring had an estimated flow of about 0.4 cfs. The outlet stream is to the north with a boulder-rubble substrate and an estimated flow of about 3-4 cfs at the time of the survey. The outlet stream is small and brushy. There is no inlet stream per. se. and no usable spawning gravel in the system.

Chemical. The lake waters had a conductivity of 70 umho/cm², a pH of 7.4 (shallow, near shore) and 7.1 (deep, mid-lake), and alkalinities of 0.0 mg/l CO₃ and 5.5 mg/l HCO₃. The surface temperature was 18 C and the bottom temperature was 16 C at 1430 hours. The air temperature was 18.0 C.

Access and Use. Access to Crystal Lake is via pack trail. The trail is about two and a half miles long. It is in good condition and not a difficult hike. A couple of rocky ledges make access by trail bike difficult. The trail approaches the lake from the north. We located four well used camp sites and four fire rings all at the north end near the trail head (Figure 2). There is a trail around the lake, but it is not well defined along the steeper east or along the south side.

There were five other people fishing at the lake during the survey period. Two stayed over night, the other three hiked in during the second day. All visitors fished the lake.

Biological Data.

Flora. Submerged, rooted aquatic plants were scarce in Crystal Lake. Shoreline vegetation consisted of 85% shrubs, 10% grass-forbs, and 10% conifers along the steep east shore; 80% conifers, 10% grass-forbs, and 10% shrubs along the south shore; 50% conifers, 35% shrubs, and 15% grass-forbs along the west shore; and 30% conifers, 50% shrubs, and 20% grass-forbs along the north shore.

Fauna (Invertebrate). The following aquatic and terrestrial invertebrates were observed and collected during the survey period. Aquatic invertebrates were Ephemeroptera (mayflies), Odonata (two species of dragon flies), and Diptera (two species, midges and mosquitoes). Terrestrial invertebrates included Diptera (two species of Tabanidae), Hymenoptera (bees), Arachnida (spiders), and Lepidoptera (two species of butterflies).

(Zooplankton). The combined shallow water and deep water plankton tows yielded the following zooplankton species. Taxa

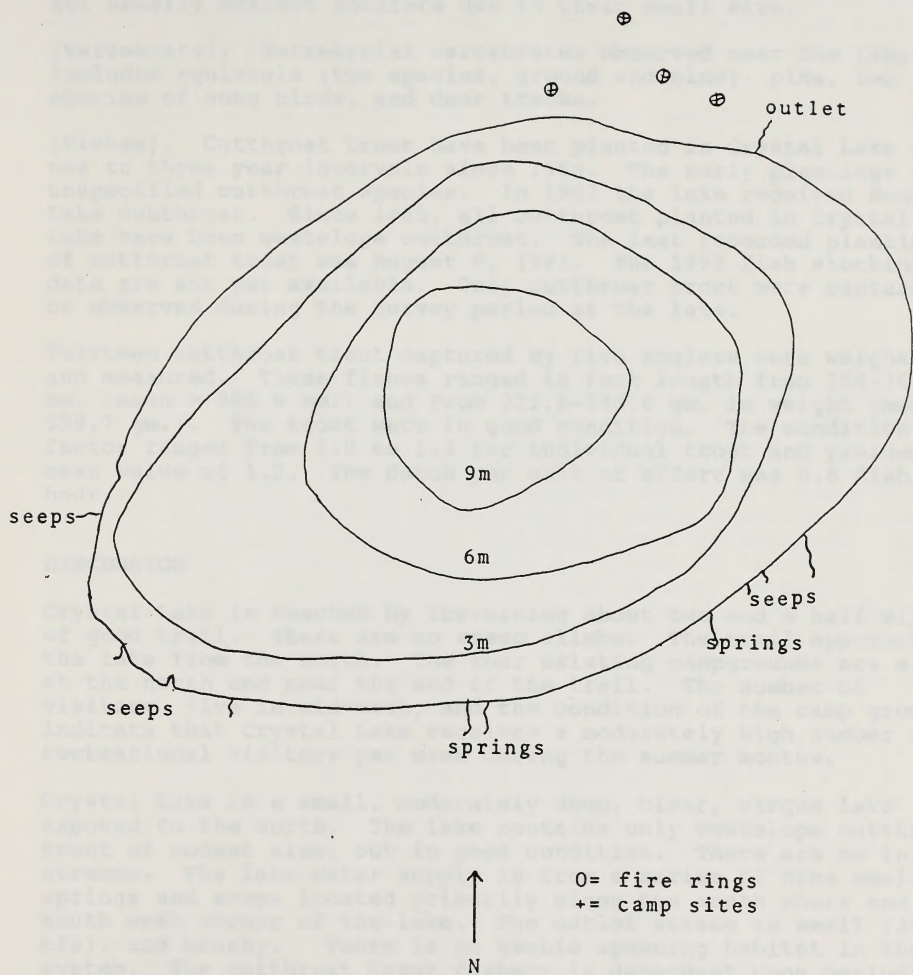


Figure 2. Crystal Lake with three meter depth contours.

captured and an approximate percentage occurrence in the samples were Cladocera (one species of Bosmina) 9.6% , Copepoda (two orders, calinoid and cyclopoid) 68%, Diptera (two species of Culicidae, mosquito larva and midges) 15.2%, Anostraca (fairly shrimp) 6.15%, and a single rotifer. The #10 plankton net does not usually collect rotifers due to their small size.

(Vertebrate). Terrestrial vertebrates observed near the lake included squirrels (two species, ground and pine), pika, two species of song birds, and deer tracks.

(Fishes). Cutthroat trout have been planted in Crystal Lake at one to three year intervals since 1968. The early plantings were unspecified cutthroat species. In 1983 the lake received Henry's Lake cutthroat. Since 1985, all cutthroat planted in Crystal Lake have been westslope cutthroat. The last recorded planting of cutthroat trout was August 8, 1991. The 1993 fish stocking data are not yet available. Only cutthroat trout were captured or observed during the survey period at the lake.

Thirteen cutthroat trout captured by five anglers were weighed and measured. These fishes ranged in fork length from 254-361.9 mm. (mean = 305.8 mm.) and from 222.6-538.6 gm. in weight (mean = 359.7 gm.). The trout were in good condition. The condition factor ranged from 1.0 to 1.3 for individual trout and yielded a mean value of 1.2. The catch per unit of effort was 0.6 fish per hour.

DISCUSSION

Crystal Lake is reached by traversing about two and a half miles of good trail. There are no steep climbs. The trail approaches the lake from the north. The four existing campgrounds are all at the north end near the end of the trail. The number of visitors, five in mid-week, and the condition of the camp grounds indicate that Crystal Lake receives a moderately high number of recreational visitors per week during the summer months.

Crystal Lake is a small, moderately deep, clear, cirque lake exposed to the north. The lake contains only westslope cutthroat trout of modest size, but in good condition. There are no inlet streams. The lake water supply is from a series of nine small springs and seeps located primarily along the south shore and south west corner of the lake. The outlet stream is small (3-4 cfs), and brushy. There is no usable spawning habitat in the system. The cutthroat trout fishery is dependent upon periodic hatchery stocking for survival.

The conductivity and alkalinities of the lake indicate a low nutrient level and moderate to low food supply to the fishes. The cutthroat trout population is, however, in good condition with an average condition factor of 1.2. The fish appear vigorous and healthy.

RECOMMENDATIONS

1. Manage the lake and the surrounding area for recreation.
2. Livestock forage is marginal on the steep slopes surrounding the lake. Grazing would be detrimental to the watershed-lake ecosystem, would conflict with recreational uses, and should not be permitted.
3. Continue to stock the lake with native westslope cutthroat trout.

MIRROR LAKE

RESULTS

Physical Habitat Data.

Location and Morphology. Mirror Lake is a small, 0.93 hectare, cirque lake located in Kootenai County, Idaho in the Twin Lakes Quadrangle, T 47N., R 1E., S 8. The lake is located at an elevation of 5780 feet immediately below Latour Peak on lands managed by the BLM in the Idaho Panhandle National Forests area. The lake is surrounded on three sides by steep mountain slopes with a north facing exposure. The lake has a maximum depth of 6.3 m., and an average depth of 3.2 m. About 18.1% of the lake is ≥ 6 m. deep. Lake depth contour lines at 3 m. intervals and the lake shore development are illustrated in Figure 3. The lake substrate to the 3 m. depth contour is comprised of large to small boulders, cobble, and gravel scattered over a silt substrate. There are submerged logs along the west shore with a small log jam in the south west corner (Figure 3).

Mirror Lake is supplied with water from four seeps and two, short flowing springs. The springs had estimated flows of 1.2-1.5 cfs during the study period. The lake outlet seeps through a rock and dirt dike across the outlet. The outlet probably only has free flow for a short period during the spring runoff period. There was no usable spawning habitat in the lake system.

Water Chemistry. Chemical testing of Mirror Lake water revealed the following characteristics. The lake water is very low in alkalinity. It has no CO_3 and only 1.0 mg/l of HCO_3 . Specific conductance was 90 $\mu\text{mho}/\text{cm}^2$, and the pH was 7.2, nearly neutral. The secchi disk was clearly visible to the bottom in the deepest water. Water temperatures were 17.0 C. at the surface and 16.0 C. at the lake bottom at 1140 hours.

Access and Use. The trail into Mirror Lake is about one half mile long and in good condition. There are no steep climbs. The hike takes only about 15-20 minutes. The lake and lake setting

are beautiful, but the area appears to be only lightly used. We counted three camp sites and nine fire rings. The camp sites were free of litter. The camps and fire rings appeared lightly used. Mirror Lake is accessed from the Latour Creek road.

Biological Data.

Flora. There were very few rooted aquatic plants present. The shoreline terrestrial vegetation consisted of 60% grass-forbs, 30% shrubs, and 10% conifers on the north side, 70% conifers, 10% grass-forbs, and 15% shrubs on the west side, 60% grass-forbs, 40% shrubs on the south shore, and 60% grass-forbs, 25% shrubs, and 15% conifers on the east side.

Fauna (Invertebrate). The following invertebrates were collected and observed during a shoreline survey and during our stay at the lake. Aquatic invertebrates consisted of Hemiptera (water skippers, Odonata (dragon flies), and Diptera (mosquitoes and midges). Terrestrial invertebrates consisted of Diptera (two species of Tabanidae flies), Hymenoptera (bees, wasps and ants), Lepidoptera (two species of butterflies) and Arachnida (spiders).

(Zooplankton). Zooplankton were moderately abundant. The following taxa were collected from combined deep and shallow water tows; Cladocera (one species of Bosmina) 36.4%, Copepoda (two orders, Calanoid and Cyclopoid) 49.9%, Diptera (Culicidae and Chaoboridae) 9.2%, Hydracarina (water mites) 3.4%, and Conchostraca (shrimp clam) 1.9%.

(Vertebrate). The following terrestrial vertebrates were observed during the survey; pine squirrels, chipmunks, pika, a small song bird, and a hawk.

(Fishes). Idaho Department of Fish and Game records indicate that Mirror Lake was stocked with 5190 Henrys Lake cutthroat trout in 1979 and with 5000 westslope cutthroat trout in 1981. The lake is crystal clear to the bottom in all locations. During the survey no fishes or any possible fish activity (rises) were observed nor were any fishes captured. Mirror Lake appears to be barren of fishes.

DISCUSSION.

Mirror Lake is a small, 0.93 hectare, cirque lake located at the foot of Latour peak. The lake is located in a beautiful setting nestled against steep, granite mountainsides. The lake is surrounded by rock slides, subalpine fir, limber pine, and shrubs. The lake is moderately deep (6.3 m.), clear, cold, and unproductive. Large plantings of fishes would quickly deplete their food supply. The lack of spawning substrate would make it doubtful that even small self-sustaining fish populations could be established. It seems unlikely that a lake with an average depth of 3.2 m., a maximum depth of 6.3 m., and very few rooted

aquatic plants would winter kill, but there has been no long term survival of cutthroat trout juveniles in Mirror Lake. It would be of interest to know if any stocked fishes survived the first winter after stocking.

Mirror Lake still attracts a few recreationists each year despite the apparent lack of fishing. The condition of the trail and campsites indicate that a few hunters, hikers, and campers are still attracted to the lake perhaps for its remoteness and beauty.

RECOMMENDATIONS

1. Manage the Mirror Lake area for recreation. Grazing forage is sparse and the Mirror Lake system is too fragile to graze.
2. Stocking of Mirror Lake with large numbers of fishes is not recommended. If another fish stocking attempt is made, it is recommended that only a very small stocking of westslope cutthroat trout or grayling fingerlings be made in early summer. Apply catch and release regulations.

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- U.S.G.S. 1950. 7.5 min. topographic map, Id., Rochat Peak Quad., T.47N., R.1E., S.31.
- U.S.G.S. 1981. 7.5 min. topographic map, Id., Twin Craggs Quad., T,47N., R. 1E. S8.

Idaho Fish and Game
Mountain Lake Survey Form

Lake Name: ANTELOPE LAKE Date: 8/11/93
 IDFG Catalog #: 0 2:0 0: 0 0:0 1 9 0 EPA #: _____
 Major Drainage: Pend Oreille Minor Drainage: Clark Fork
 County: Bonner Region: _____
 USFS Ranger Dist: Sandpoint Wilderness Area: None
 Section: 12 Township: 55N Range: 2E Elevation: 2770 feet

PHYSICAL:

Lake Type: 1 1. cirque 2. moraine 3. slump 4. caldera 5. beaver
 Total Surface Area: 7.7 Hectares
 Depth profile: 3 Aspect: 4
 1. deep (75% of lake >6m deep) 1. Lake has north facing exposure
 2. moderate (50% of lake >6m deep) 2. Lake has south facing exposure
 3. shallow (25% of lake >6m deep) 3. Lake has east facing exposure
 Maximum Depth 10.2 meters 4. Lake has west facing exposure
 Average Depth 5.1 meters 5. Lake is exposed in all directions

Shallow Alk CO_3 4.0ppm Shallow
 deep Alkalinity $CO_3 = 0.0 HCO_3 / 1$ 3.5 Conductance 130 pH 7.6 ^{9.1 at surface}
 Conductance 139 umho/cm² @ 25C Temp (surface) 23.0 C ^{near bottom}
 Secchi depth 10.0 meters Temp (bottom) 16.5 C ^{1320 hrs}

Spawning Potential

Inlet(s) 0 (number) Outlet(s) 1 (number) 0.1 cfs
 Length accessible for spawning 0 meters Length accessible for spawning 0 meters
 Inlet spawning suitability: 4 Outlet spawning suitability: 4

1. excellent (abundant)
2. adequate (enough to maintain suitable spawning population)
3. fair (not adequate to maintain population)
4. poor (not suitable for successful spawning)

USE

Campsites 5 (number) Fire pits 5 (number) Litter L ^(M) H
 Trail around lake: complete X partial, trampled: YES NO
 Access: good trail poor trail cross country
 Access is by two miles of road in poor condition. The trail around the lake is poor and little used on the east, south, and southwest sides of the lake.

BIOLOGICAL

Zooplankton Composition and Density

Genera Identified	% of sample	Size	Density (o/l)
Cladocera (Bosmina-2 sp)	36.8		abundant
Copepoda (Calinoid & cyclopidae)	49.5		abundant
Diptera (chaoboridae & culicidae)	9.3		common
Conchostraca (shrimp & clam)	1.0		scarce
Hydracarina (water mites)	3.4		Few

The plankton represent the results of the combined shallow and deep water samples.

ANTELOPE LAKE

Insect Composition and Abundance

Aquatic Genera	relative abundance			Terrestrial Genera	relative abundance		
	L	M	H		L	M	H
Hemiptera	L	M	H	Diptera (3 spp)	L	M	(H)
Coleoptera	L	M	H	Hymenoptera (2 Spp)	L	(M)	H
Odonata	L	(M)	H	Lepidoptera (1 Spp)	(L)	M	H
Diptera (midges)			(L)	Arachnida (1 sp.)	(L)	M	H
Fish Survey Culicidae (Mosquitos) ^{400 M}				Formicidae (1 Sp)	L	(M)	H
Fishermen 4 (numbers)				Hours fished 6.5 (total)			
Fish caught 16				Fish / hour 2.5			
				Abundance L M (H)			

Length Frequency (Collection Method: x angling; gill net - net hours)

Species	Total Length in mm								
	10-49	50-99	100-149	150-199	200-249	250-299	300-349	350-399	400+
Rainbow						5	6	1	
Total									

Fish Condition

Species	Total Length (mm)		Weight (g)		Condition (K)	
	mean	range	mean	range	mean	range
Rainbow	305.8	254-362	355.9	241-538.6	1.24	1.1-1.5

Stocking History

Year	Species	Number of Fish	Comments
1969	O. mykiss	500 to 10,000	Lately stocking have been about 500
	O. clarki	per plant	fish per stocking two to three times
			per year
1992	O mykiss		

COMMENTS:

Idaho Fish and Game
Mountain Lake Survey Form

Lake Name: CRYSTAL LAKE Date: 8 / 13 / 93
IDFG Catalog #: 03:00: 00:0160 EPA #: _____
Major Drainage: Spokane Minor Drainage: Coeur d'Alene
County: Benewah Region: _____
USFS Ranger Dist: Fernan Wilderness Area: None
Section: 31 Township: 47N Range: 1E Elevation: 5290 feet

PHYSICAL:

Lake Type: 1 1. cirque 2. moraine 3. slump 4. caldera 5. beaver
Total Surface Area: 4.7 Hectares
Depth profile: 2 Aspect: 1
1. deep (75% of lake >6m deep) 1. Lake has north facing exposure
2. moderate (50% of lake >6m deep) 2. Lake has south facing exposure
3. shallow (25% of lake >6m deep) 3. Lake has east facing exposure
Maximum Depth 11.7 meters 4. Lake has west facing exposure
Average Depth 4.3 meters 5. Lake is exposed in all directions

Chemical CO₂=0.0 shallow 7.4
Alkalinity 4.0 mg/l pH deep 7.1
Conductance 70 umho/cm² @ 25C Temp (surface) 18.0 C 1435 hrs
Secchi depth 11.7 meters Temp (bottom) 16.0 C air 18.0c

Spawning Potential

9 seeps and springs
Inlet(s) 0 (number) Outlet(s) 1 (number)
Length accessible for spawning _____ meters Length accessible for spawning _____ meters
Inlet spawning suitability: 4 Outlet spawning suitability: 4

1. excellent (abundant)
2. adequate (enough to maintain suitable spawning population)
3. fair (not adequate to maintain population)
4. poor (not suitable for successful spawning)

USE

Campsites 4 (number) Fire pits 5 (number) Litter (L) M H
Trail around lake: _____ complete X partial, trampled: YES (NO)
Access: X good trail _____ poor trail _____ cross country

BIOLOGICAL

Zooplankton Composition and Density

Genera Identified	% of sample	Size	Density (o/l)
Cladocera - <u>Bosmina</u>	<u>9.6</u>	_____	_____
Copepoda - <u>calinoid & cyclopoid</u>	<u>68.0</u>	_____	_____
Diptera - <u>culicidae</u>	<u>15.7</u>	_____	_____
Anostraca - <u>fairy shrimp</u>	<u>6.1</u>	_____	_____
*Rotifera	<u>0.5</u>	_____	_____

The #10 net does not usually capture rotifers. This is an incidental catch and does not indicate the relative abundance of rotifers. The plankton net was not metered.

CRYSTAL LAKE

Insect Composition and Abundance

Aquatic Genera	relative abundance	Terrestrial Genera	relative abundance
<u>Ephemeroptera</u>	(D) M H	<u>Diptera (2 spp)</u>	L (M) H
<u>Odonata</u>	L (M) H	<u>Hymenoptera (1 Spp)</u>	(L) M H
<u>Diptera (midges)</u>	L M (H)	<u>Lepidoptera (1 spp)</u>	(L) M H
<u>Culicidae (mosquitos)</u>	L (M) H	<u>Formicidae (1 spp)</u>	L (M) H

Fish Survey
 Fishermen 10 (numbers) Hours fished 24 (total)
 Fish caught 15 Fish / hour 0.6 Abundance (L) (M) H

Length Frequency (Collection Method: x angling; gill net - net hours)

Species	Total Length in mm								
	10-49	50-99	100-149	150-199	200-249	250-299	300-349	350-399	400+
<u>O. clarki</u>						6	5	1	
Total									

Fish Condition

Species	Total Length (mm)		Weight (g)		Condition (K)	
	mean	range	mean	range	mean	range
<u>O. clarki</u>	305.8	254-364.9	359.7	222.6-538.6	1.2	1.0-1.3

Stocking History

Year	Species	Number of Fish	Comments
1968	<u>O. clarki</u>	2520	2520
1980		9988	largest stocking
1991		2500	good survival and growth

COMMENTS:

MIRROR LAKE

Insect Composition and Abundance

Aquatic Genera	relative abundance			Terrestrial Genera	relative abundance		
	L	M	H		L	M	H
Diptera (midge)	L	M	H	Diptera (3 spp)	L	M	H
Coleoptera (1 spp)	L	M	H	Coleoptera (1 spp)	L	M	H
	L	M	H	Lepidoptera (1 Spp)	L	M	H

Fish Survey

Fishermen 2 (numbers) Hours fished 1 (total)
 Fish caught 0 Fish / hour 0 Abundance (L M H)
 barren of fish

Length Frequency (Collection Mehtod: x angling; ___ gill net - net hours ___)

Species	Total Length in mm								
	10-49	50-99	100-149	150-199	200-249	250-299	300-349	350-399	400+
Total									

Fish Condition

Species	Total Length (mm)		Weight (g)		Condition (K)	
	mean	range	mean	range	mean	range

Stocking History

Date	Species	Number of Fish	Comments
	O. mykiss		none survived
	S. fontinalis		
	O. clarki		
	O. trutta		
	O. nerka		

COMMENTS: Mirror Lake was stocked eight times in 1992 with four species.

MIRROR LAKE

Insect Composition and Abundance

Aquatic Genera	relative abundance			Terrestrial Genera	relative abundance		
	L	M	H		L	M	H
Diptera (midge)	L	M	H	Diptera (3 spp)	(L)	M	H
coleoptera (1 spp)	(L)	M	H	coleoptera (1 spp)	(L)	M	H
	L	M	H	lepidoptera (1 Spp)	(L)	M	H

Fish Survey

Fishermen 2 (numbers) Hours fished 1 (total)
 Fish caught 0 Fish / hour 0 Abundance (L M H)
 barren of fish

Length Frequency (Collection Mehtod: x angling; _____ gill net - net hours _____)

Species	Total Length in mm								
	10-49	50-99	100-149	150-199	200-249	250-299	300-349	350-399	400+
Total									

Fish Condition

Species	Total Length (mm)		Weight (g)		Condition (K)	
	mean	range	mean	range	mean	range

Stocking History

Year	Species	Number of Fish	Comments
1962	O. mykiss		none survived
	S. fontinalis		
	O. clarki		
	O. trutta		
1992	O. nerka		

COMMENTS: Mirror Lake was stocked eight times in 1992 with four species.

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USER'S CARD

10.93-3

opies of three
s in northern

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(Continued on reverse)

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